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(54) Cut length adjusting apparatus.

(57) An improved cut length adjusting apparatus in a folding machine of a rotary press is disclosed. The folding machine generally consists of a saw drum having two saw blades disposed on its circumference nearly at equal angular intervals, and a folding drum rotating synchronously with but in the opposite direction to the saw drum. The saw drum is formed of an outer cylinder and an inner cylinder which are mutually rotatable and which have one saw blade respectively projected therefrom. The improvements reside in that a helical gear adapted to be meshed with another helical gear at the axial end of the folding drum is provided at the axial end of at least one of the outer and inner cylinders, and either one of the helical gear at the axial end of the outer or inner cylinder and the helical gear at the axial end of the folding drum is formed to be movable in the axial direction. Owing to the improved structure, by moving either one of the above-mentioned helical gears in the axial direction, the outer cylinder and the inner cylinder are relatively rotated, and so, the circumferential distance between the two saw blades are varied. Thereby the cut length of a sheet to be cut by these saw blades can be precisely adjusted.

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CUT LENGTH ADJUSTING APPARATUS

BACKGROUND OF THE INVENTION:

Field of the Invention:

The present invention relates to a cut length adjusting apparatus that is available for effecting switching between an operation of cutting a continuous paper web into equal lengths and an operation of cutting it alternately into varied cut lengths, and especially the invention is applicable to a folding machine in a rotary press (in particular, a rotary press for newspapers).

Description of the Prior Art:

Among the requirements for unequal length cutting by a saw drum, various requirements such as adjustment of cut-off lengths of A and B sheets (as will be described later) depending upon folded total pages when the folding has been switched from straight folding to collective folding (See Fig. 3(a)), adjustment when it is desired to increase a circumferential length of a pattern, or the like are known.

To that end, as shown in Fig. 3, in the prior art either one or both of a pair of cutter cases 02 each holding a saw blade 01 were moved within a groove 04 of a saw drum 03, and after a cut length between the saw blades 01 and 01′ had been adjusted by means of a spacer 05, the cutter cases 02 were fixed by means of wedges 06.

However, the apparatus in the prior art as described above involved the following problems:

(1) While it is necessary to change a cut-off length between a folded sheet held in contact with a saw drum (hereinafter called "sheet A") and a folded sheet superposed on the first folded sheet (hereinafter called "sheet B") depending upon the superposed number of the sheets A and B when straight folding has been switched to collective folding, according to the method in the prior art it takes much time for extracting the wedges, and a time of about 10 minutes is necessitated.

(2) Since the cut-off lengths of the sheets A and B are adjusted by means of the spacers, necessarily human labor is required for exchange of the spacers, and hence remote control or unmanned operation cannot be realized.

(3) Adjustment of size in a stepless manner cannot be achieved.

SUMMARY OF THE INVENTION:

It is therefore one object of the present invention to provide a cut length adjusting apparatus which can adjust a cut length of paper sheets quickly and in a stepless manner.

According to one feature of the present invention, there is provided a cut length adjusting machine in a folding machine of a rotary press consisting of a saw drum having two saw blades disposed on its circumference nearly at equal intervals and a folding drum rotating synchronously with but in the opposite direction to the saw drum, in which the saw drum is formed of an outer cylinder and an inner cylinder having one saw blade respectively projected therefrom and mutually rotatable, a helical gear adapted to be meshed with another helical gear at the axial end of the folding drum is provided at the axial end of at least one of the outer cylinder and the inner cylinder, and either one of the helical gear at the axial end of the outer or inner cylinder and the helical gear at the axial end of the folding drum is formed to be movable in the axial direction, whereby the outer and inner cylinders can be relatively rotated by moving either one of the helical gears in the axial direction.

More particularly, the characteristic features of the present invention reside in the following points:

(1) A saw drum is formed of an outer cylinder supporting one saw blade and an inner cylinder inserted within the outer cylinder and supporting the other saw blade. A helical gear mounted on the outer cylinder so as to be slidable in the axial direction is moved by means of a moving device, and the outer cylinder is made to rotate in the circumferential direction by the action of a driving helical gear meshed with the first-mentioned helical gear and fixed to the folding drum.

(2) During the period when the outer cylinder rotates in the circumferential direction, rotation of the inner cylinder is restrained by the provision that with a gear such as a helical gear or the like mounted to the shaft of the inner cylinder is always meshed another driving gear such as a driving helical gear or the like fixed to the folding drum.

(3) The opposite relations to those described in paragraphs (1) and (2) above are acceptable. That is, rotation of the inner cylinder and restraint from rotation of the outer cylinder are acceptable.

(4) The helical gear that is slidable in the axial direction as described in paragraph (1) above, could be the helical gear on the side of the folding drum.

In operation of the cut length adjusting apparatus according to the present invention as featured above, since either one of the helical gear on one of the inner and outer cylinders and the helical

gear at the end of the folding drum can move in a stepless manner, with respect to a saw blade disposed on the inner cylinder held at a fixed position the saw blade disposed on the outer cylinder can be moved in the circumferential direction of the saw drum in a stepless manner, and therefore, the cut-off length can be adjusted in a stepless manner.

The above-mentioned and other objects, features and advantages of the present invention will become more apparent by reference to the following description of preferred embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings:

Fig. 1 shows one preferred embodiment of the present invention, Fig. 1(a) being a longitudinal cross-section view of a saw drum and a folding drum, and Fig. 1(b) being a transverse cross-section view taken along line X-X in Fig. 1(a) as viewed in the direction of arrows;

Fig. 2 shows another preferred embodiment of the present invention, Fig. 2(a) being a longitudinal cross-section view of a saw drum and a folding drum, and Fig. 2(b) being a transverse cross-section view taken along line Y-Y in Fig. 2(a) as viewed in the direction of arrows; and

Fig. 3 shows a cut length adjusting apparatus in the prior art which relies upon manual works, Fig. 3(a) being a schematic transverse cross-section view of a saw drum and a folding drum, and Fig. 3(b) being a schematic enlarged partial view of the saw drum in the prior art.

DESCRIPTION OF THE PRIOR ART:

One preferred embodiment of the cut length adjusting apparatus according to the present invention is illustrated in Fig. 1. In this figure, reference numerals 1 and 1′ designate saw blades, numerals 2 and 2′ designate cutter cases, numerals 3 and 3′ designate mount pieces, numeral 11 designates a saw drum, numeral 12 designates an outer cylinder, numeral 13 designates an inner cylinder, numeral 14 designates a slide key, numeral 15 designates a helical gear, numeral 16 designates a shifter, numeral 17 designates a screw rod, numeral 18 designates a rotary body, numerals 19 and 20 designate sprockets, numeral 21 designates a chain, numeral 22 designates a motor, numeral 23 designates a folding drum, numeral 24 designates a helical gear, numeral 25 designates a key, numerals 26 and 27 designate helical gears, numerals 28, 29 and 30 designate bearings, and numeral 31 designates a bush.

The saw drum 11 comprises the outer cylinder 12 and the inner cylinder 13 inserted within the outer cylinder 12 and the inner cylinder 13 is rotatably supported via the bush 31 within the outer cylinder 12.

To the outer cylinder 12 is fixedly secured the cutter case 2 holding the saw blade 1 via the mount piece 3, while to the inner cylinder 13 is fixedly secured the cutter case 2′ holding the saw blade 1′ via the mount piece 3′, the saw blades 1 and 1′ are disposed at diametrically nearly opposed positions on the circumference of the outer cylinder 12 as shown in Fig. 1(b), and their tip ends project from the outer circumference of the outer cylinder 12. Also, as shown in Fig. 1(b) between the mount piece 3 and the inner cylinder 13 and between the mount piece 3′ and the outer cylinder 12 are respectively provided gap spaces so that the outer cylinder 12, the mount piece 3, the cutter case 2 and the saw blade 1 can rotate in the circumferential direction relatively to the inner cylinder 13, the mount piece 3′, the cutter case 2′ and the saw blade 1′. At one axial end 12a of the outer cylinder 12 is provided the helical gear 15 which is mounted via the key 14 or splines so as to be slidable in the axial direction, and the shifter 16 mounted to the gear 15 is threadedly engaged with a threaded flange portion 17a of the screw rod 17. When the sprocket 19 fixedly secured to the rotary body 18 is rotated via the chain 21 by the sprocket 20 mounted to the axial end of the motor 22 associated with reduction gears, the gear 15 is moved in the axial directions (in the directions of arrows) by the threaded flange portion 17a of the screw rod 17. Since the helical gear 24 for driving the outer cylinder 12 mounted at one axial end 23a of the folding drum 23 is meshed with the helical gear 15, as a result of the axial movement of the gear 15, the helical gear 15 would rotate in the circumferential direction depending upon the twist angle of the helical gear. On the other hand, at the axial end 13a of the inner cylinder 13 on the opposite side to the above-described axial end 12a of the outer cylinder 12 is provided the helical gear 26 which is mounted via the key 25, and since the helical gear 26 is meshed with the helical gear 27 mounted on the other axial end 23b of the folding drum 23 for driving the inner cylinder 13, rotation of the inner cylinder 13 in the circumferential direction can be prevented by the helical gear 27 which is held at a stationary state during stoppage of the folding machine. Since the outer cylinder 12 rotates with respect to the inner cylinder 13 that is held at a stationary state in the above-described manner, a difference would arise between the interval in the circumferential direction from the saw blade 1 to

the saw blade 1' and the interval in the circumferential direction from the saw blade 1' to the saw blade 1, and so, the cut lengths of the sheet-A and the sheet-B would be different (See Fig. 3). Accordingly, the cut-off lengths of the sheet-A and the sheet-B can be adjusted in a stepless manner. It is to be noted that the parameters P.C.D. (pitch circle diameter) of the helical gears 15, 24, 26 and 27 are all the same, and the outer cylinder 12, the shifter 16 and the rotary body 18 are rotatably supported by the bearings 28, 29 and 30, respectively.

Also it is to be noted that in the above-described structure, in place of the helical gear 26 mounted to the inner cylinder 13 and the helical gear 27 on the folding drum 23 to be meshed with the helical gear 26, spur gears could be employed.

Another preferred embodiment of the present invention which is somewhat different from the first preferred embodiment in Fig. 1, is illustrated in Fig. 2.

In the embodiment shown in Fig. 2, the gear 15 for the inner cylinder of the saw drum and the gear 26 for the outer cylinder are not dispersed at the respective ends, but they are gathered on one side. Accordingly, in contrast to the fact that in Fig. 1 the party gears on the folding drum side are necessitated two, that is, the helical gear 24 and the helical gear 27 are necessary, in the embodiment shown in Fig. 2 the helical gears are united into a single helical gear 32. While the axially movable helical gear 15 and the slide key 14 are mounted to the axial end 12a of the outer cylinder on the left side in the embodiment shown in Fig. 1, in Fig. 2 they are mounted to the axial end 13a of the inner cylinder 13 on the right side. In addition, while the moving device such as the motor associated with reduction gears is disposed on the right side in the embodiment shown in Fig. 2, the effects and advantages of the apparatus are identical.

As will be seen from the detailed description above, according to the present invention, in a folding machine of a rotary press consisting of a saw drum having two saw blades disposed on its circumference nearly at equal intervals and a folding drum rotating synchronously with but in the opposite direction to the saw drum, owing to the fact that the saw drum is formed of an outer cylinder and an inner cylinder having one saw blade respectively projected therefrom and mutually rotatable, a helical gear adapted to be meshed with another helical gear at the axial end of the folding drum is provided at the axial end of at least one of the outer cylinder and the inner cylinder, either one of the helical gear at the axial end of the outer or inner cylinder and the helical gear at the axial end of the folding drum is formed to be movable in the axial direction, the outer and inner cylinders are relatively rotated by moving either one of the helical gears in the axial direction, and thereby the intervals between the saw blades are varied, the following advantages are offered:

1) Since spacers are not used for the adjustment of cut lengths of the sheets A and B, the cut lengths can be set any appropriate values in a stepless manner within the movable ranges of the saw blades.

2) The cut-off length adjustment work which necessitated at least 10 minutes in the case of the adjustment by means of spacers in the prior art, can be finished in about 10 seconds, and a preparatory time therefor can be shortened. This is extremely important at the time of printing of newspapers.

3) In the prior art, an operator entered in the folding machine and carried out the adjustment by means of spacers, whereas according to the present invention, adjustment of the cut-off lengths can be effected from the outside of the folding machine by push-button operations. Accordingly, the adjustment is safe, and at the same time it can be preset by commands from a computer or the like.

While a principle of the present invention has been described above in connection to preferred embodiments of the invention, it is intended that all matter contained in the specification and illustrated in the accompanying drawings shall be interpreted to be illustrative and not as a limitation to the scope of the invention.

Claims

1. A cut length adjusting apparatus in a folding machine of a rotary press consisting of a saw drum having two saw blades disposed on its circumference nearly at equal intervals and a folding drum rotating synchronously with but in the opposite direction to said saw drum; characterized in that said saw drum is formed of an outer cylinder and an inner cylinder having one saw blade respectively projected therefrom and mutually rotatable, a helical gear adapted to be meshed with another helical gear at the axial end of the folding drum is provided at the axial end of at least one of said outer cylinder and said inner cylinder, and either one of the helical gear at the axial end of said outer or inner cylinder and the helical gear at the axial end of said folding drum is formed to be movable in the axial direction, whereby said outer and inner cylinders can be relatively rotated by moving either one of said helical gears in the axial direction.

2. A cut length adjusting apparatus as claimed in Claim 1, characterized in that helical gears adapted to be meshed with other helical gears at the axial ends of the folding drum are provided

respectively at the axial ends of said outer and inner cylinders, and either one of the helical gear at the axial end of one of said outer and inner cylinders and the helical gear at the axial end of the folding drum is formed to be movable in the axial direction.

3. A cut length adjusting apparatus as claimed in Claim 2, characterized in that helical gears adapted to be meshed with other helical gears at the axial ends of the folding drum are provided at the axial ends on the opposite sides of said outer and inner cylinders.

4. A cut length adjusting apparatus as claimed in Claim 2, characterized in that helical gears adapted to be meshed with other helical gears at the axial end of the folding drum are provided at the axial ends on the same side of said outer and inner cylinders.

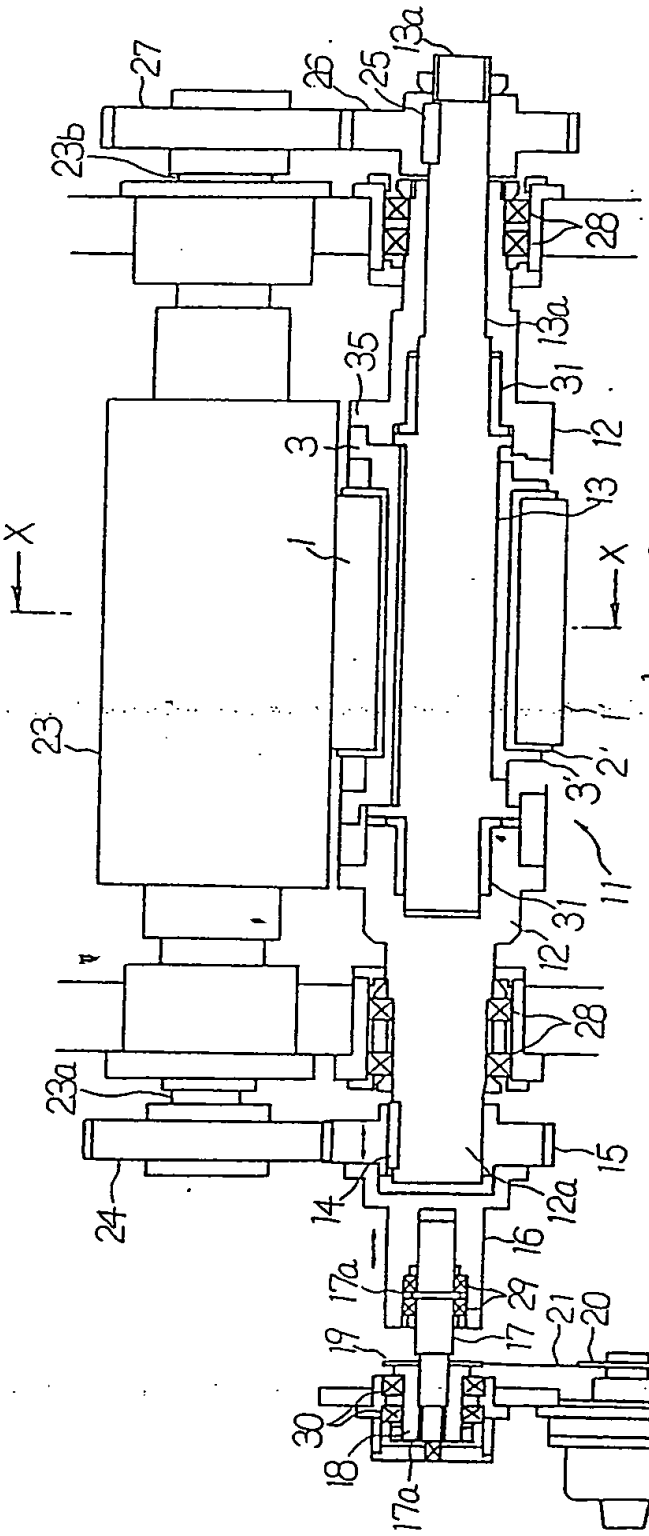


Fig. 1(a)

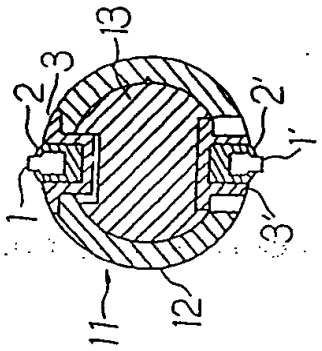
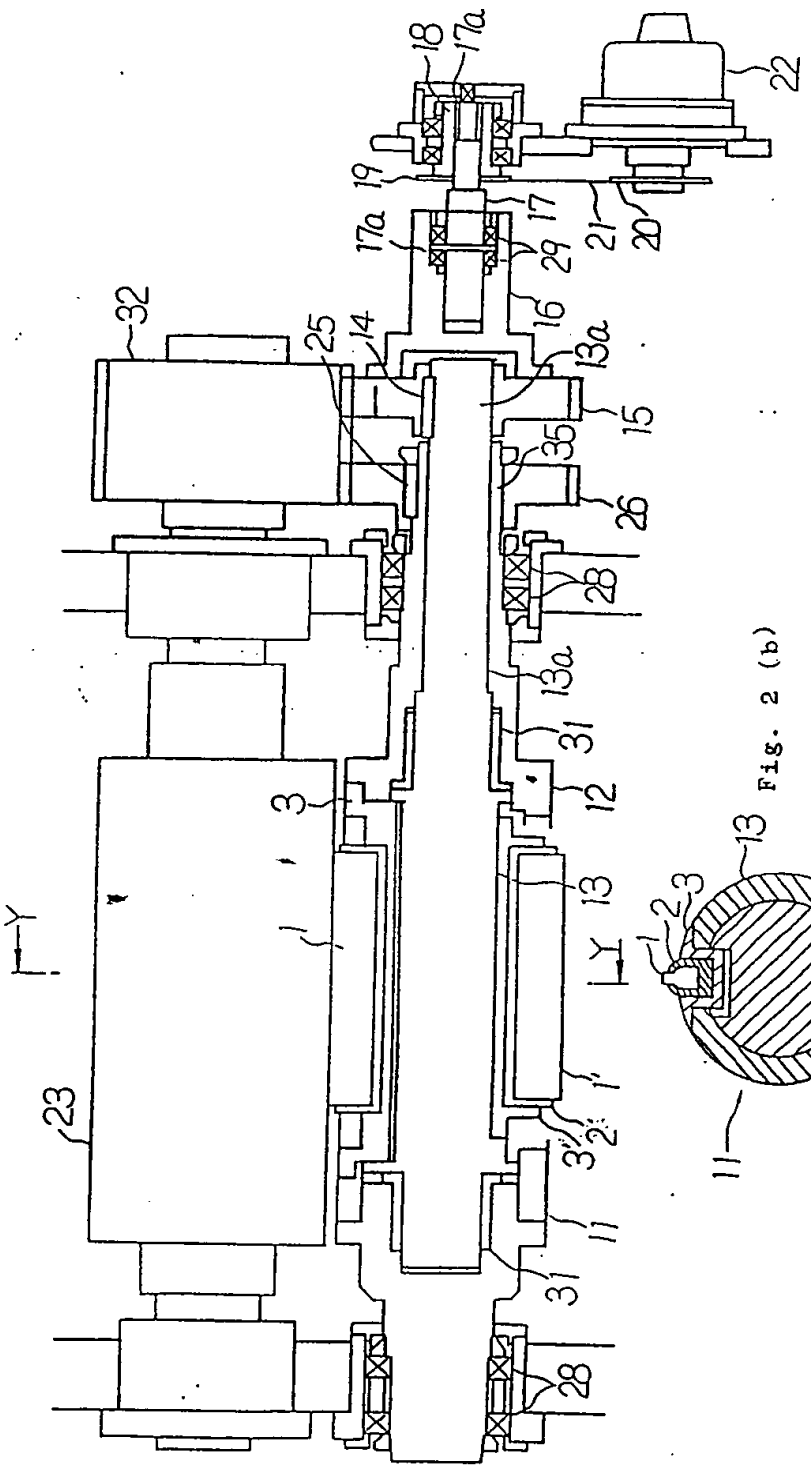


Fig. 1 (b)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13a
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12
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23
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2'
3'
11
31
28

Fig. 2 (a)

13
2
3
1
2'
1'
3'
12
11

Fig. 2 (b)

Fig. 3 (a) (Prior Art)

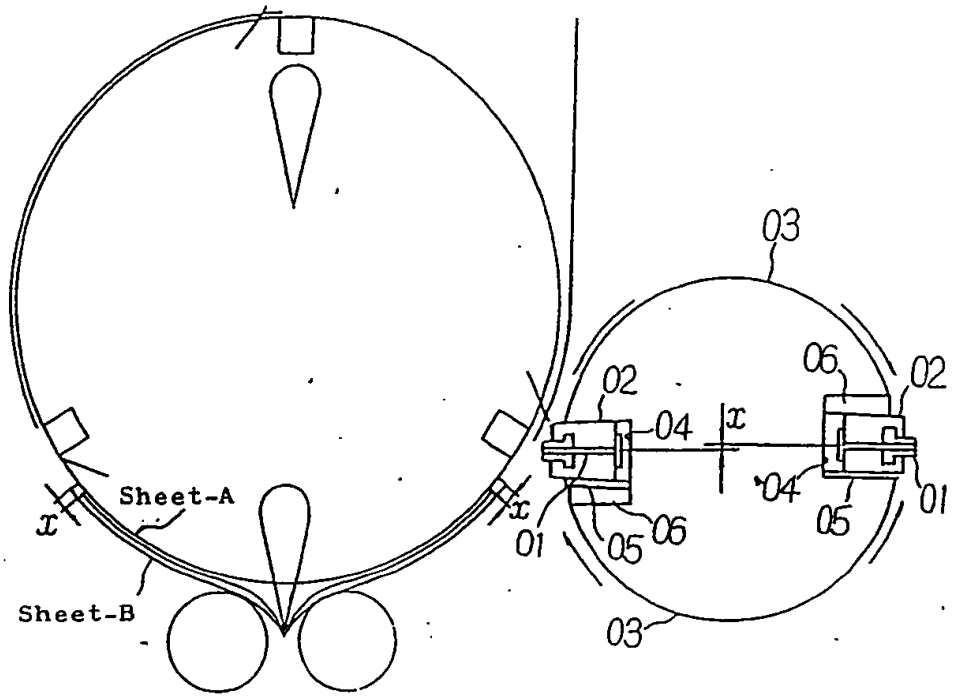
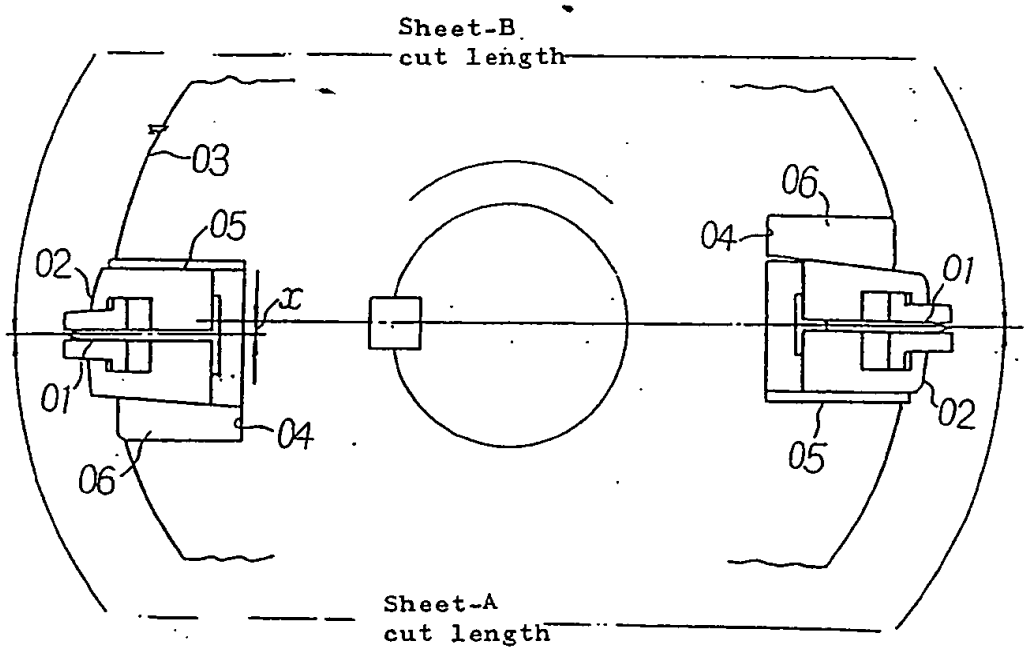


Fig. 3 (b) (Prior Art)



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(54) Cut length adjusting apparatus.

(57) An improved cut length adjusting apparatus in a folding machine of a rotary press is disclosed. The folding machine generally consists of a saw drum having two saw blades (1,1') disposed on its circumference nearly at equal angular intervals, and a folding drum (23) rotating synchronously with but in the opposite direction to the saw drum. The saw drum is formed of an outer cylinder (12) and an inner cylinder (13) which are mutually rotatable and which have one saw blade respectively projected therefrom. The improvements reside in that a helical gear (15,26) adapted to be meshed with another helical gear at the axial end of the folding drum is provided at the axial end of at least one of the outer and inner cylinders, and either one of the helical gear (15,26) at the axial end of the outer or inner cylinder and the helical gear at the axial end of the folding drum is formed to be movable in the axial direction. Owing to the improved structure, by moving either one of the above-mentioned helical gears in the axial direction, the outer cylinder and the inner cylinder are relatively rotated, and so, the circumferential distance between the two saw blades are varied. Thereby the cut length of a sheet to be cut by these saw blades can be precisely adjusted.

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EUROPEAN SEARCH REPORT

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EP 89 11 8812

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-2941798 (HESS AND BARKER) * column 4, line 74 - column 5, line 54; figures 10, 11 *	1-3	B41F13/60 B65H45/16
A	DE-A-1786292 (VEB POLYGRAPH LEIPZIG) * page 2, line 19 - page 5, line 28; figure 1 *	1, 4	
A	FR-A-2348023 (MACHINES CHAMBON)		
A	US-A-3460823 (WOOD INDUSTRIES)		

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TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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B26D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 AUGUST 1990	LONCKE J.W.

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